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COMMUNICATIONS

EXPERIMENTAL STUDY OF HISTOGENESIS OF EYE ABNORMALITIES IN THE CHICK EMBRYO

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THE eyes of all embryos are at the beginning of their development very large in comparison with the other organs of the body. No matter to what cause it may be due, this disproportionate growth seems to make the eye especially subject to malformations. I have recently obtained some eye abnormalities from experiments on chick embryos, and these I wish to record very briefly in this paper.

By eye abnormalities I mean here chiefly anophthalmia and microphthalmia. In regard to cyclopia I did not obtain a single perfect specimen in all my experiments with chick embryos, although Stockard[1] claims to have obtained a few typical cyclopean monsters. He found, however, that in most instances cyclopia did not develop. On the other hand, in the fish there have been many successful experiments in producing cyclopia since those of Stockard. It may

be possible that cyclopia is more easily produced in the fish than in the bird.

In a wide review of literature Weber[2] presents two theories regarding the production of monsters: (I) the amniotic theory, i.e., mechanical theory; (II) the chemical theory. He supports the latter with many interesting experiments.

Hess[3] concluded, on the basis of his studies on several kinds of embryos, that inflammation processes do not play the chief rôle in causation of abnormalities of the eye, as was formerly thought to be the case, though even now some authors take the view that it does.

Bach[4] announces an hypothesis, that microphthalmia, as well as many other abnormalities, is to be explained from a primary, abnormal character and size of the lens.

There are many other papers dealing with abnormalities of the eye, but they need not be summarized here.

Numerous methods of producing abnormalities have been tried in my experiments with chick eggs, but I describe here only 52 of the cases, which were obtained by 4 methods:

(1) Salt solution (0·85 per cent.) injected into the albumen near the blastoderm.

(2) Distilled water ,, ,,

(3) Air ,, ,,

(4) The albumen near the blastoderm is very slightly stirred with a needle.

As the first manipulation we disinfect each egg with alcohol or tincture of iodine at a place on the upper surface somewhat nearer the small than the large end of the shell. Here we make a small hole in the shell, and then keeping the eggs in the same position we inject some material with a sterilized syringe in the albumen or stir this near the blastoderm, because the blastoderm lies always on the upper surface of the yolk.

After these manipulations we close the hole in the shell with a piece of disinfected paper and paraffin, and then put the eggs away in the incubator, keeping always the same side up. Some time afterwards we break the shell carefully and examine the embryo in detail with the help of a lens or binocular microscope. Then, if we find an abnormally developing embryo, we fix it, imbed it in paraffin and cut it into serial sections. We diagnosed "anophthalmia," when there was no eye at all or a trace of an eye. As controls 54 eggs were used, but no abnormalities were found.

I. Sterile salt solution (0.85 per cent.) was injected into the albumen near the blastoderm.* In all 190 eggs were treated in this

*34 injected with 0·75 cc. solution; 124 with 1·0 cc. solution; 22 with 1·5 cc. solution; and 10 with 2·0 cc. solution.

way. After 3—8 days the shell was broken and the embryo was examined. The results were as follow:

Injected quantity.	0.75 cc.		1.0 cc.		1.5 cc.		2.0 cc.	
	Eggs.	Per cent.	Eggs.	Per cent.	Eggs.	Per cent.	Eggs.	Per cent.
Developed abnormally	2	5.88	31	25.0	1	4.55	2	20.0
Developed normally	5	14.7	25	20.16	3	13.64	1	10.0
Failed to develop or found dead	27	79.41	68	54.84	18	81.81	7	70.0

We obtained 36 abnormal embryos in all, or 18.95 per cent. We find the following abnormalities, when classified in detail.

Microphthalmia 18 < 10.....one side
8.....both sides

Anophthalmia 11 < 8.....both sides
3.....one side

Acephalous 6
Anomalia cerebri 18

The individual cases are as follows:

1. Embryo of five days; anomalia cerebri; microphthalmia (both sides). 1·0 cc. injected. The brain seems folded and covers the eyes. The prosencephalon is not closed dorsally. The eyes on both sides are somewhat smaller than normal, but their structure is not so far from the normal.

2. Embryo of six days; anomalia cerebri; microphthalmia (one side). 1·0 cc. injected. In the brain there are many dilated blood-vessels, especially on the left side, so that the brain-tissue of this side is pressed somewhat towards the right and therefore the right eyeball is smaller than the other, which seems normal.

3. Embryo of seven days; anophthalmia (one side). 1·0 cc. injected. On the right side there is no trace of the eye, while the other eye is normal.

4. Embryo of six days; anomalia cerebri; microphthalmia (both sides). 1·0 cc. injected. The eyes on both sides are smaller than normal, nothing else notable.

5. Embryo of six days; microphthalmia (one side). 1·0 cc. injected. One eye is smaller than normal and it has a luxatio lentis.

6. Embryo of seven days; anomalia cerebri; anophthalmia (one

side). 1·0 cc. injected. The head is very much deformed, and while one eye is almost normal in size the other is represented only by an accumulation of pigment cells (Figs. 1 and 2).

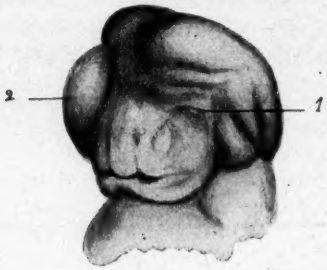

FIG. 1.

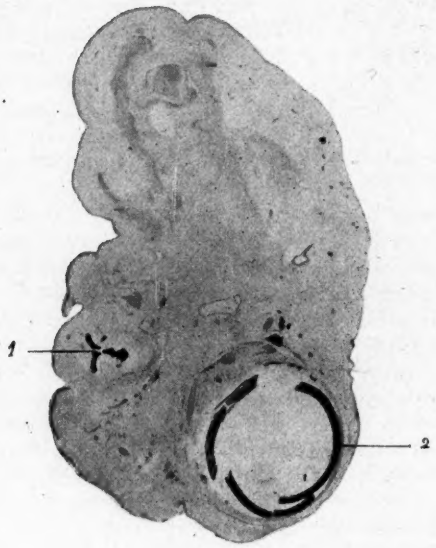

FIG. 2.

1.—Anophthalmia
(Trace of an eye.)
2.—Normal eye.

7. Embryo of seven days; anomalia cerebri. 1·0 cc. injected. The brain has many abnormal folds on its surface and the prosencephalon is not closed. The eyes are situated nearer each other than normal, but they seem to be of normal size.

8. Embryo of eight days; acephalous. 0·75 cc. injected. The heart is actively beating, but there is no development of the head or extremities. Even the notochord cannot be found.

9. Embryo of six days; microphthalmia (both sides). 1·0 cc. injected. The eyes on the both sides are a little smaller than normal and their lenses are dislocated.

10. Embryo of five days; anomalia cerebri; microphthalmia (both sides). 1·0 cc. injected. The head is somewhat flattened dorsally. One eye is much smaller and the other a bit smaller than normal.

11. Embryo of six days; anomalia cerebri; anophthalmia (one side); microphthalmia (one side). 1·0 cc. injected. The surface of the brain is irregularly folded. On the one side there is a trace of the eye, which exists only as a linear colony of pigment cells. On the other we find a smaller eye which consists of an imperfect optic cup and a lens.

12. Embryo of seven days; microphthalmia (one side). 1·0 cc. injected. One eye is smaller than the other, which seems to be of the normal size. Nothing else is notable.

13. Embryo of six days: anomalia cerebri; microphthalmia (both sides). 2·0 cc. injected. In the brain we see an enormous development of blood-vessels, especially on the left side. Therefore the brain looks deformed and the eyes are compressed and a little smaller than normal.

14. Embryo of five days; anomalia cerebri; anophthalmia (both sides). 1·0 cc. injected. The embryo being amorphous we cannot differentiate sharply the headpart from the rest, but in the serial sections we find on one side a colony of pigment cells, which, perhaps, may be a trace of an eye.

15. Embryo of five days; acephalous. 1·0 cc. injected. The neural tube and the notochord are developed imperfectly, and the head is not yet differentiated, therefore no eye is to be found.

16. Embryo of five days; microphthalmia (one side). 1·0 cc. injected. One eye is smaller than normal; nothing else notable.

17. Embryo of five days; microphthalmia (one side). 1·0 cc. injected. Just the same as No. 16.

18. Embryo of four days; microphthalmia (one side). 1·0 cc. injected. One eye is smaller than the normal size; nothing else notable.

19. Embryo of four days; anomalia cerebri; microphalmia (both sides). 1·0 cc. injected. The head is sagitally flattened and the prosencephalon is not yet closed, so that both eyes are dislocated towards the front of the brain and approach each other. They are smaller than normal.

20. Embryo of four days; anomalia cerebri; anophthalmia (both sides). 1.0 cc. injected. The brain is abnormal, the prosencephalon is not yet closed and no trace of an eye is to be found.

21. Embryo of four days; acephalous. 1·0 cc. injected. The differentiation of the head was interrupted, so that there is not even a trace of an eye.

22. Embryo of six days; anomalia cerebri; anophthalmia (both sides). 1·0 cc. injected. The head is abnormally developed; the prosencephalon is not closed and no trace of an eye is to be found.

23. Embryo of five days; acephalous. 1·0 cc. injected. The differentiation of the neural tube is very irregular and there is no development of the head.

24. Embryo of six days; anomalia cerebri; anophthalmia (both sides). 1·0 cc. injected. The differentiation of the brain is abnormal and there is no trace of an eye, but the heart is nevertheless very large.

25. Embryo of six days; microphthalmia (both sides). 1·0 cc. injected. Both eyes are somewhat smaller than normal; nothing else notable.

26. Embryo of six days; anomalia cerebri. 1·0 cc. injected. In the brain there are greatly dilated blood-vessels, so that some brain tissues are compressed by them, but the eyes seem to keep the normal size.

27. Embryo of six days; anomalia cerebri; anophthalmia (both sides). 1·0 cc. injected. The head is sagitally flattened and the prosencephalon is not closed. On the one side some blood-vessels of the brain are dilated. One eye develops only as a small colony of pigment cells, while the other fails entirely.

28. Embryo of six days; anomalia cerebri; anophthalmia (both sides). 1·0 cc. injected. The differentiation of the brain is imperfect and there is no trace of an eye to be found.

29. Embryo of six days; microphthalmia (one side). 1·0 cc. injected. One eye is a bit smaller than normal; nothing else notable.

30. Embryo of four days; acephalous. 1·0 cc. injected. The development of the neural tube is imperfect and the differentiation of the head portion almost totally lacking, so that there is no trace of an eye to be found.

31. Embryo of six days; anomalia cerebri; anophthalmia (both sides). 1·5 cc. injected. The head is deformed and the prosencephalon is not closed. There is no trace of an eye.

32. Embryo of five days; acephalous. 0·75 cc. injected. The neural tube developed imperfectly and the head part not sharply differentiated from the other parts, so that no trace of an eye is to be found, but the heart is very large.

33. Embryo of four days; anomalia cerebri; anophthalmia (both sides). 1·0 cc. injected. The head is sagitally flattened and the prosencephalon is not closed. The eyes on both sides show themselves only as a vestige consisting of pigment cells.

34. Embryo of four days; microphthalmia (one side). 2·0 cc.

injected. One eye is smaller than normal; nothing else notable.

35. Embryo of three days; anomalia cerebri; microphthalmia (both sides). 1·0 cc. injected. Development of the brain is imperfect and its prosencephalon is not closed. The eyes on both sides are smaller than normal.

36. Embryo of three days; microphthalmia (one side). 1·0 cc. injected. One eye is a bit smaller than normal; nothing else notable.

II. Distilled water was injected into the albumen near the blastoderm. In all, 24 eggs were treated in this way. After four to seven days the shell was broken and the embryo examined. The results were as follow:

Injected quantity.	0·5 cc.		0·75 cc.		1·5 cc.	
	Eggs.	Per cent.	Eggs.	Per cent.	Eggs.	Per cent.
Developed abnormally ...	3	25·0	1	16·67	1	16·67
Developed normally...	1	8·33	0	—	0	—
Failed to develop or found dead ...	8	66·67	5	83·33	5	83·33

We obtained five abnormal embryos in all, or 20·83 per cent., and we can find on them the following abnormalities.

Microphthalmia 2 < 1.....one side / 1.....both sides

Anophthalmia 3 < 1.....one side / 2.....both sides

Acephalous 1

Anomalia cerebri 3

The individual cases are as follow:

37. Embryo of five days; acephalous. 0·7 cc. injected. The neural tube and notochord are poorly developed, and no part of the head can be identified, nor can any trace of an eye be found. The heart is well developed.

38. Embryo of seven days; microphthalmia (both sides). 0·5 cc. injected. One eye is especially small, and its lens is lying on the outside of the optic cup. The other eye is also a bit smaller than normal.

39. Embryo of four days; anomalia cerebri; anophthalmia both sides). 1·5 cc. injected. The heart is dislocated over the

head and actively beating. The head is deformed and there is no trace of an eye.

40. Embryo of four days; anomalia cerebri; anophthalmia (both sides). 0·5 cc. injected. The neural tube and notochord are developed, but the differentiation of the head part is exceedingly imperfect, and there is no trace of an eye.

41. Embryo of six days; anomalia cerebri; anophthalmia (one side); microphthalmia (one side). 0·5 cc. injected. The head is deformed and the prosencephalon not closed. One eye is smaller than normal, while the other is lacking altogether.

III. Air was injected into the albumen near the blastoderm. In all 30 eggs were treated in this way. After four or five days the shell was broken and the embryo examined. The results were as follow:

Injected quantity.	1.0 cc.	
	Eggs.	Per cent.
Developed abnormally	5	16·67
Developed normally	2	6·67
Failed to develop or found dead	23	76·67

We obtained five abnormal embryos in all, or 16·75 per cent., and we can find on them the following abnormalities:

Microphthalmia	3	1.....one side 2.....both sides
Acephalous	2	
Anomalia cerebri	1	

The individual cases are as follow:

42. Embryo of five days; acephalous. 1·0 cc. injected. There is no differentiation of the head beyond the stage of the medullary plate. In the area vasculosa we see here and there several aneurysm-like bodies beating. No trace of the eye is to be found in the serial sections.

43. Embryo of four days; microphthalmia (both sides). 1·0 cc. injected. The eyes on both sides are a little smaller than normal; nothing else notable.

44. Embryo of four days; acephalous. 1·0 cc. injected. There is an irregular development of the ectoderm and no differentiation of the head part.

45. Embryo of four days; microphthalmia (one side). 1·0 cc. injected. One eye is a bit smaller than normal; nothing else notable.

46. Embryo of four days; anomalia cerebri; microphthalmia (both sides). 1·0 cc. injected. The prosencephalon is not closed. The eyes on both sides are smaller than normal.

IV. Albumen near the blastoderm was stirred gently with a sterile needle. In all forty-eight eggs were treated in this way. After three to six days the shell was broken and the embryo examined. The results were as follows:

	Eggs.	Per cent.
Developed abnormally	6	12·5
Developed normally	7	14·58
Failed to develop or found dead...	35	72·92

We obtained six abnormal embryos in all, or 12·5 per cent., and we can find in them the following abnormalities.

Microphthalmia 3 < 2.....one side
1.....both sides

Anophthalmia 4 < 2.....one side
2.....both sides

Anomalia cerebri 4

The individual cases are as follows:

47. Embryo of six days; anomalia cerebri; microphthalmia (both sides). The head is deformed, and the prosencephalon is not closed. The eyes on both sides are very small and their lenses are not developed (Figs. 3 and 4).

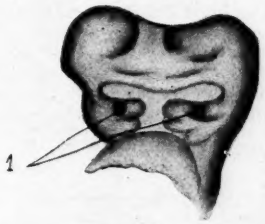

FIG. 3.

48. Embryo of six days; anophthalmia (one side); microphthalmia (one side). Only one eye is developed, which is smaller than normal. No trace of the other eye is to be found.

49. Embryo of six days; anomalia cerebri; anophthalmia (both sides). The embryo was oval in shape. The differentiation of the head was exceedingly imperfect, and there was no trace of the eye.

50. Embryo of three days; microphthalmia (one side). One eye is smaller than normal; nothing else notable.

51. Embryo of four days; anomalia cerebri; anophthalmia (one side); microphthalmia (one side). The cavity of the brain is greatly enlarged. Only one eye is developed, which is smaller than normal. No trace of the other eye is to be found.

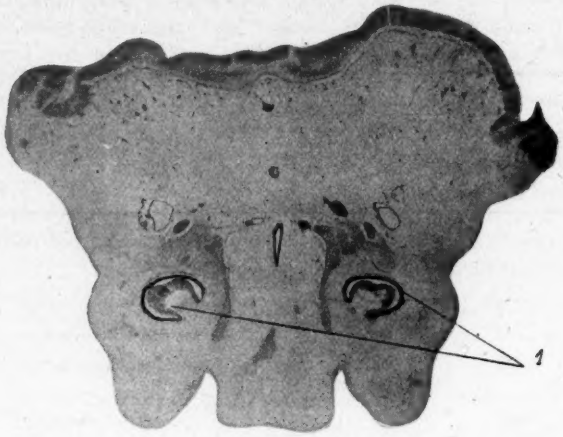

FIG. 4.
1.—Microphthalmia.

52. Embryo of three days; anomalia cerebri; anophthalmia (both sides). The differentiation of the brain is imperfect, and there is no trace of the eye to be found.

The abnormalities (52 chick embryos of three to eight days) may be summarized as follows:

Microphthalmia		27
One side	15	
Both sides	12	
Anophthalmia		18
One side	6	
Both sides	12	
One side microphthalmia and the other anophthalmia		4
Acephalous		9
Anomalia cerebri		27
(Anomalia cerebri without anomalia bulbi oculi, 2)		
Microphthalmia with anomalia cerebri (44·4 per cent. of all cases of microphthalmia) ...		12
Anophthalmia with anomalia cerebri (83·3 per cent. of all cases of anophthalmia)		15

That is to say, anophthalmia accompanies deformities of the brain oftener than microphthalmia. In short, anophthalmia and microphthalmia are due to the same cause, and anophthalmia is a more advanced stage of the deformity than microphthalmia.

In four cases (No. 2, 13, 26, and 27) we see great dilatation of blood-vessels in the brain. This phenomenon is, of course, a result of our manipulation of the eggs and it is accompanied by some deformity of the brain. Moreover, two of these cases have abnormalities of the eye (the one has microphthalmia and the other anophthalmia); but we cannot conclude from this dilatation of blood-vessels that all abnormalities of the eye are due to inflammatory processes of eye itself or of the tissues surrounding it, because in most of the cases there was no dilatation of blood-vessels in the brain.

By many authors various kinds of chemical substances have been used in their experiments on the origin of monsters. The present experiments on chick embryos demonstrate, however, that besides chemical substances we must recognize certain physical factors (stirring of the albumen or change of the pressure in the eggs, etc.) as causes of abnormal development of embryos. From these observations I draw the following conclusion:

At the beginning of the developing of the embryo, any factor, either chemical or physical, which can disturb the normal condition of the blastoderm itself or its circumference, may bring about an abnormal differentiation of the embryo. If such disturbance of the normal condition is too great, development of the embryo may be entirely arrested. But if development is still possible, some deformity of the embryo may result, especially terata of the head and abnormalities of the eye varying according to the degree of the disturbance.

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THE NOTATION OF AXES OF CYLINDERS

Systems in Vogue in the British Isles with Recommendation

BY

J. GRAY CLEGG,

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IT appears to me that now a suitable opportunity is presented of investigating the systems of designating the axes of cylinders at

present in vogue in this country, and how far the recommendations of the International Congress held at Naples in 1909 have been adopted.

At the previous International Congress in 1904, at Lucerne, a Committee was appointed to investigate the various methods of notation and to recommend one for universal acceptance. The Committee consisted of Messrs. Charpentier (Nancy), Dimmer (Graz), Eperon (Lausanne), Hess (Würzburg), Jessop (London), Nuel (Liège), and Reymond (Turin).

It will be observed that the late energetic and distinguished ophthalmologist, Mr. Jessop (whose loss we all so much deplore), was one of the members, and I have with me his original notes and diagrams of the various schemes considered by the Committee. I need not go into a detailed description of them and their relative advantages.

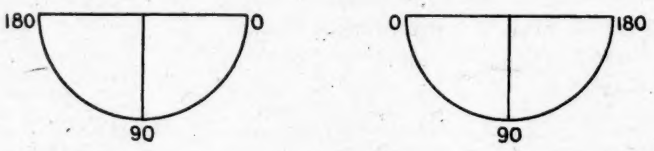
The Committee's report was as follows:

"The Committee, having carefully considered the various methods at present in use, have unanimously come to the following conclusions:

1. That the meridians of astigmatism should be measured and represented as the observer looks at the patient.

2. That the best and most practical method to measure and represent the axes is in the lower semi-circle as in a trial frame.

The numbering of the axes should start from the middle line of the face in each eye, and proceed downwards and temporalwards. The zero would therefore lie at the nasal end of the semi-circle, and 180° at the temporal end; 90° would be below, and mid-way between these points.



The method has the merit of simplicity as in noting an axis only the number of degrees found need be stated. It also fulfils the important point that the usually symmetrical meridians of ocular astigmatism are represented by the same number."

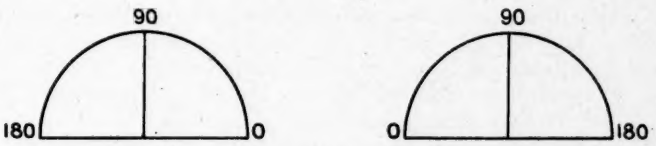
When, however, the report came up for discussion, Mr. Jessop, on behalf of the Commission, said that the question as to whether the direction of the axis notation should be on the superior or on the inferior semi-circle was of secondary importance, and after hearing various speakers and their views, he submitted the following propositions:

1. That the meridians of astigmatism should be measured and represented as the observer looks at the patient.

2. That the best and most practical method is to measure and denote the axis on the superior semi-circle.

3. The measurements in each eye should start from zero on nasal side to 180° at the temporal, 90° being represented above and in the centre.

Then various views were expressed by members of the Congress showing marked differences of opinions as to the best method. The original recommendations of the Committee were supported by Mackay (Edinburgh), Rowan (Glasgow), and others. On the proposition of Landolt the Congress accepted the original report with the modification, however, that the sequence of degrees should proceed on the superior semi-circle from the nose to the temporal side. He was supported by Freytag (Munich), Grossmann (Liverpool), Pagenstecher (Wiesbaden), Menacho (Barcelona), Blaauw (Buffalo), and Essad (Constantinople).



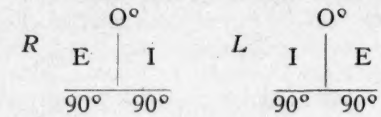
N.B.—This diagram is shown inverted (by error) in the Transactions of the International Congress, 1909, on page 609.

The chief argument in favour of the use of the superior semi-circle was, that in questions concerning torsion of the globe the upper end of the vertical diameter of the cornea is in mind, but I consider that utility in practice should outweigh even this sound scientific view, for as Mackay said at the Congress, at Naples, "the majority of my compatriots employ trial frames with the meridians marked below the eyes."

A statement of the decision of the Congress was presented to the Ophthalmological Society of the United Kingdom by Mr. Jessop in June, 1909, and it appears in Vol. XXIX of its *Transactions*.

It is interesting to note that at the same Naples Congress two papers were read on this very subject. One by Percival of Newcastle, advocating the system (No. 2 of Jessop's), but with the semicircle below, now known as the "Standard." The other is by Ed. Pergens of Maesyck, Belgium. He considered the matter historically, and after reviewing several methods he concluded that the best is one suggested by J. Zachariah Laurence in 1864

in an article entitled "An Instrument for Measuring the Axis of Astigmatism," which appeared in the *Ophthalmic Review*.



Pergens says that no error is possible by this system, for it matters not whether the axis is regarded from the point of view of the observer or the patient.

Green, in 1867, made a modification in Laurence's diagram, substituting − and + thus $\frac{-}{+}$ This same system was published by Snellen in 1868, as new. It has been and is still in use at the Manchester Royal Eye Hospital and the Manchester Royal Infirmary.

I am, however, more concerned with the present state of affairs, and the possibility of attaining uniformity in practice than with a discussion of the various methods of designating axes and their relative advantages.

I have, therefore, communicated with some 168 hospitals in Great Britain and Ireland, which I assumed have ophthalmic departments, and have received a copy of the prescription forms of 126. A few of them shew no numeral system, but 121 I have been able to classify. I have arranged them into 11 groups.

The first nine count degrees from 0 to 180, the last two from 0 to 90 only. The first three alone show symmetry, and although A employs a circle, and B and C an inferior and superior semicircle respectively, an angle on any of the three would have the same inclination. I have, for convenience, designated this group "Contra-International." The sequence of numbers is clock-wise in the right eye, and anti-clock-wise in the left.

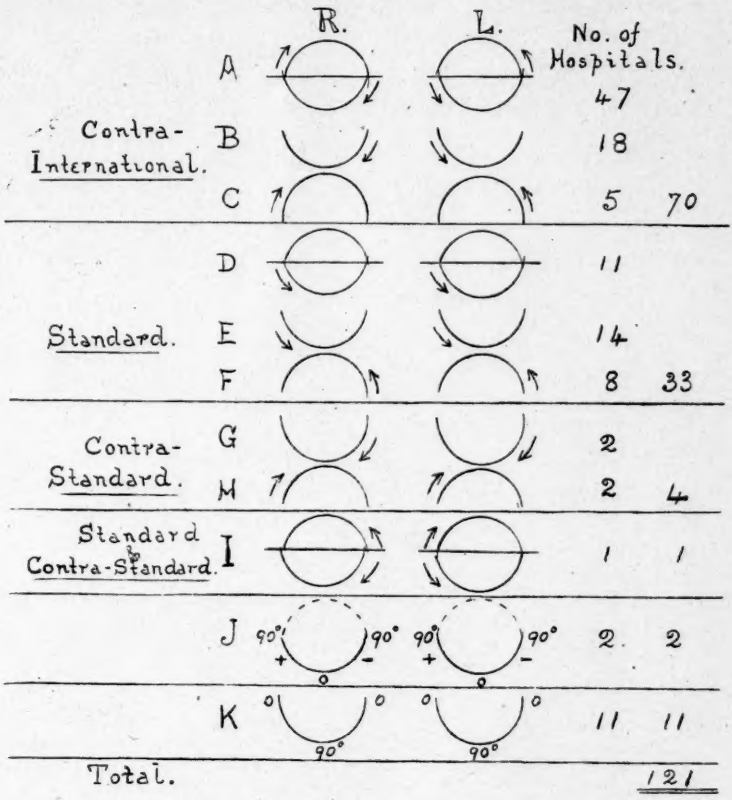
The next group (D E F) employs circle, inferior and superior semicircle. It is asymmetrical and is counter clock-wise for each eye. Again, an angle on any of the three would have the same number. This is the "Standard" system. G and H are asymmetrical, but the sequence is clock-wise. I have called it "Contra-Standard."

I stands by itself, for it counts angles clock-wise and anti-clock-wise.

J and K only employ angles counting to 90°. In J the zero is in the vertical meridian, but in K in the horizontal. In both these systems some signs, other than the mere degree number, are required. In J + and − are used, indicating from above down to the right of the patient's face, or to the left, respectively. K also requires an indication in addition to the number of the angle, such as T (temporal), N (nasal), or E (external), I (internal).

I am informed this system was, for a time, in use in some parts of the British Army in France, "do" or "di," being added to the figure, meaning so many degrees "down and out" or "down and in."

It will be observed that in no hospital in the United Kingdom



Contra-International	...	70
Standard	...	33
Other Systems	...	18
		121

International ... None.

→ indicates direction of degrees 0 to 180.

and Ireland is the International system in vogue. Further, that what I have designated "Contra-International" by far holds the premier place, and that it has an absolute majority over all other systems combined, viz. 70 against 51.

When this paper was first written, a year ago, it appeared to me that here was an opportunity of obtaining uniformity of practice, at any rate in the British Isles. I then considered that an effort should be made to get all British ophthalmic hospitals to adopt the contra-international mode, as it would bring about the least possible disturbance; fifty-one institutions only would have to change their systems, leaving 70 practically unchanged.

There are now, however, other factors to be considered. The relationship of the United States of America has been intimate, and is likely to become so still more.

In the American edition of "Fuchs's Ophthalmology," Duane states that the prevailing system there is the standard (Fig. F.) although with the axis number appearing on the upper semicircle.

Again, the Standard (Fig. E.) is now, I believe, the only one in use in the British Army, and in the optical trade no other system is employed. Prescriptions are always converted into Standard notation before they are actually made up. The Standard has the great advantage that the degree number is the same for both eyes, and therefore, in ordering, merely the strength and the axis number is required. Prescriptions by telegram are thus simplified. It is purely mathematical. The Standard system certainly does not conform with the anatomical idea of symmetry, but such theoretical considerations will have to be waived if the easiest path to uniformity in this country and America is to be taken.

The subject is one which the newly formed Council of British Ophthalmologists ought to consider, and with the weight of its prestige induce uniformity in all institutions, at any rate, in the United Kingdom. The only difference being that here it is usual to think of the numbers in the lower semicircle, whereas in America the upper is used.

IODINE IN INFLAMMATION OF THE EYE

BY

RICHARD KERRY, M.D.,

OCULIST TO THE WESTERN AND CHILDREN'S MEMORIAL HOSPITALS, MONTREAL

THE hypodermic use of iodine in inflammatory conditions of the eye, has, in the writer's experience, yielded consistently satisfactory results for a number of years past, particularly in septic iritis and in tuberculosis of the eye. The drug apparently acts by dispersing inflammatory foci, thus producing relief from pain which is a great boon to the patient, and which alone would justify its use, quite independently of its curative effect.

The cases detailed below show some interesting and important results and are here recorded to illustrate what may be accomplished by the use of iodine hypodermically.

CASE 1.—A woman, aged 40 years, left eye absolute glaucoma, right eye seriously impaired, vision about 6/18, came for treatment seven or eight years ago. A 3 mm. hole was punched in the sclera with a dental engine and trephine; Elliot's operation had not then been published, and vision returned to normal. She came again three or four years afterwards complaining of pain and loss of sight; there were hypertension, ciliary injection, and cloudiness of the media. She was given a hypodermic of iodine and returned in three days with all signs and symptoms simply abolished. In about two weeks she was back again with a recurrence, all symptoms being much more severe than during the previous attack. She was again given iodine and directed to have a number of decayed teeth extracted. All signs again disappeared; the eye became quiet and normal vision returned. During the past autumn, about three years after the last attack, she came again, the eye being unfortunately quite blind. In the writer's absence she had come to the hospital and, not finding him, had gone elsewhere. An iridectomy had been done but the anterior chamber had not reformed and the tissues about the wound were matted in exudate. Had this case been treated as previously with perhaps a trephine operation in addition, the sight would probably have been preserved.

CASE 2.—A woman of thirty-five in robust condition, had all the usual signs of glaucoma, vision $\frac{6}{36}$ to $\frac{6}{24}$. The symptoms were quite severe, and the inability to use the eyes, even when wearing her glasses, was very marked, and caused great distress. Refractive error was 2·5 of hypermetropia in each eye. She had been wearing +2, but was given +3 for temporary use and eserin and massage were ordered.

There was some initial improvement but this was not maintained, so she was given an injection of iodine, once a week for four weeks. At the end of this period vision for distance was normal. Little weakness of focussing power was left, and she was using the eyes without distress. She did not report again for nearly a month. The eyes were now rather sensitive to light but were causing no trouble during near work. This patient had marked gingivitis, both upper and lower gums being involved. X ray examination showed absorption at the root of a left upper bicuspid, which was also carious, a similar condition at the root of the right canine tooth was thought to be present, but as the changes were slight there was some doubt of this.

Treatment for the gums was ordered early but the bicuspid, the principal offender, was not extracted until her return after Christmas, so that the improvement in the eyes took place despite the presence of the principal exciting cause.

Cultures taken from the root of the tooth and the cavity showed in one instance almost pure streptococci with a few staphylococci, in

the other staphylococci in almost pure culture. The tooth in broth gave in addition bacillus coli and some saprophytes.

So long as there is no sign of recurrence operation will naturally not be considered in this case.

The comparison of the results in these two cases with those obtained in iritis suggests a similarity in the cause of the two diseases.

If glaucoma can be proved to be septic in origin, the infection must be of a different type from that found in iritis, and the second case quoted suggests the presence of mixed infection. There are a number of clinical and pathological observations which tend to show that glaucoma is septic, and that the hypertension is due to blocking of the emunctories from the eyeball.

Although these considerations are partly theoretical they correlate glaucoma rationally with the other inflammatory conditions of the uvea and are in remarkable agreement with the conclusions reached by Martin Fischer, from entirely different data, and published in his illuminating book, "Oedema and Nephritis."

CASE 3.—The next case is interesting because of the marked result obtained from one dose only. Three years ago the patient, a well known man of fifty odd years, had been below par for some months. His physician stated that he had "slow tuberculosis," the lesion being pulmonary. On being questioned by a friend, he suddenly found that he could not see with the left eye.

Examination showed quiet iritis, vision P.L. only. The eye was painless with slight ciliary injection, cornea fairly clear, aqueous turbid, iris details indistinct, the pupil was contracted and both secluded and occluded; in the anterior chamber was an exudate membrane which had evidently covered all the anterior surface of the iris and the pupil; it had become detached above and the upper third was folded downwards and hanging in the chamber. The condition undoubtedly justified a serious prognosis. He was given an injection of iodine. Next day the aqueous was clear; on the second day the membrane had almost completely disappeared and on the third day there was a well dilated pupil, atropin of course being used. Subsequently the disease took on a more acute form with pain, injection, and the formation of some posterior synechiae, but the symptoms were not severe. In about two months conditions were practically normal and there has been no trouble since.

The effect of iodine is most marked in attacks of acute inflammation. The following two cases show, however, that its action in chronic cases is also marked and indicate that the leucocytes and connective tissue are most affected.

CASE 4.—A girl, aged about twenty years; right eye lost from ophthalmia neonatorum, left almost completely covered with a dense leucoma from the same cause, hiding all details of the iris and pupil. She was treated irregularly for two years (being absent during the

summer months), at times once a week at others once a fortnight. At present the leucoma is less than half its former size; a healthy looking iris can be seen through the upper part of the cornea, which is perfectly clear. The lower part of the cornea, however, does not clear, the opacity here being due to alteration in the corneal tissue, while above there has apparently been only cell infiltration.

CASE 5.—A man, aged 50 years, under treatment for syphilis for two years; blood reported negative. Right eye practically no vision, due to macular involvement. The left eye showed almost complete disappearance of the vessels of the fundus in a mass of exudate which covered them; two short lengths of vessel, equal to about three-quarters of the diameter of the disc in extent, alone were visible. This was a marked example of the condition which some authorities term retinitis proliferans, and was the most extensive syphilitic alteration of the vessels that the writer has seen. The vision, which was less than 6/60, rose to 6/18 under iodine treatment, and then receded, the deterioration being accompanied by pigmentary changes in the macular region. The interesting feature in this case is the marked absorption of the exudate in the fundus which has occurred; the dense white tracts are much thinner and smaller, and, where the exudate has disappeared, dark brownish red cords run across the fundus showing the vessels quite empty. With such complete vascular disorganization it is, perhaps, not surprising that the vision could not be saved. Another interesting feature in this case is that during the time when his sight was relatively good and treatment had been remitted for some time, he came in one day with acute inflammation of the eye, the condition resembling closely that which obtained in the first glaucoma case. On resuming the iodine the condition disappeared with the same rapidity as in the other case.

As we have a reasonable amount of evidence as to the marked activity of iodine, a somewhat more detailed examination of its action in these cases will enable the reader to appreciate more completely its effects, and to use it to greater advantage. In addition to the marked stimulation to glandular secretion and activity in the tissues which it causes, iodine, by its power of removing cell infiltration in inflammatory cases, disembarrasses the circulation. By this means it disperses focal infection, and throws infective material and inflammatory products into the blood. Where the initial lesion is not extensive no constitutional reaction is observed. In more extensive lesions, in a case, for example, of an old disease of the knee joint with atrophy, its use has caused a condition resembling *grippe* for a day or so. In the still more extensive lesions found in pulmonary tuberculosis, with a relatively large diseased area, acute toxaemia will result, which may prove fatal. The effect of one dose only of one quarter of a grain

in an adult, as instanced in several of the cases quoted, is very remarkable.

The solution used in the cases reported is iodine in sesame oil, one to forty. Ten minims are injected once a week, occasionally twice. If injection is made into the skin an induration results, which will last a long time, but causes no inconvenience. If into the subcutaneous tissue there is usually nothing noticeable after a week; intramuscular injection would probably cause more severe reaction, but it has not been used by the writer. Occasionally sharp local reactions develop, or the effect may be felt all through a limb, but this quickly subsides.

The results obtained from the routine use of iodine in iritis and tuberculosis of the eye, quite apart from those obtained by the writer in a large number of other cases, afford more than sufficient evidence of the great usefulness of this method of using the drug. The fact that it is injected hypodermically, and thus acts constitutionally, indicates that its use may be greatly extended, and it has already proved a most useful remedy in the hands of the general practitioner.

NOTE ON AN EARLY CASE OF MULES'S OPERATION

BY

HAROLD GRIMSDALE,

LONDON.

THE statement sometimes made that the globe in Mules's operation always eventually escapes, suggests the publication of the following note:

Mary D. was admitted into St. George's Hospital under the care of the late Mr. R. Brudenell Carter, on August 24, 1888, on account of a painful blind eye. The cause of the blindness is stated to have been iridocyclitis.

Three days later Mr. Carter performed Mules's operation. The wound was closed by a single layer of sutures; the line of closure was horizontal. The course of healing was uneventful, according to the notes, and the patient left the hospital with the glass globe well covered.

She came to St. George's Hospital on July 12, 1919—almost 31 years after the operation—for glasses for the right eye. Recognizing from the appearance that the original operation probably had been Mules's, I made enquiries and was able readily to find the original notes.

The stump is well covered; the globe with the enclosing sclerotic is about 15 mm. in diameter and the movements are very good. She has always worn a glass shell eye without trouble.

CAN SIMPLE CONCUSSION OF THE BRAIN GIVE RISE TO OPTIC NEURITIS?

BY

L. B. FLEMING, Captain R.A.M.C.,

EYE SPECIALIST, BOMBAY BRIGADE.

ON January 2, 1919, E. J. was thrown from his horse whilst racing over hard ground, landed on the back of his head, and became unconscious; his memory for the following week was quite blank. On February 25, 1919, he began to have headaches, which gradually increased in severity, and at the end of March he was found to have optic neuritis. On April 1, 1919, a lumbar puncture was performed and 20 c.c. of cerebro-spinal fluid withdrawn; this relieved his headache.

On April 14, 1919, when I saw him, his condition was as follows: R. V., 6/12 and J. 6, with glasses 6/6 and J. 1. L. V., 6/6 and J. 1, with glasses 6/6 and J. 1. R. E., margins of disc slightly blurred; swelling 1.5 D. Small amount of exudate round origin of vessels, and one haemorrhage on inferior nasal artery on disc. L. E., margins of disc slightly blurred; swelling of disc 0.75 D. One small haemorrhage immediately to temporal side of disc. Small inferior branch of superior temporal artery partly hidden by exudate. No other haemorrhage or exudate. B. E., veins full but not engorged; arteries on the small side. Apart from headaches there are no other symptoms.

As it appears that there is nothing beyond simple concussion to have produced the neuritis, it would be interesting to know if there are any other such cases on record.

GUNSHOT INJURIES OF THE CORTICAL VISUAL AREAS

BY

JAMES ALEXANDER WILSON, M.D.,

LATE RESIDENT SURGEON, THE LORD DERBY WAR HOSPITAL, WARRINGTON.

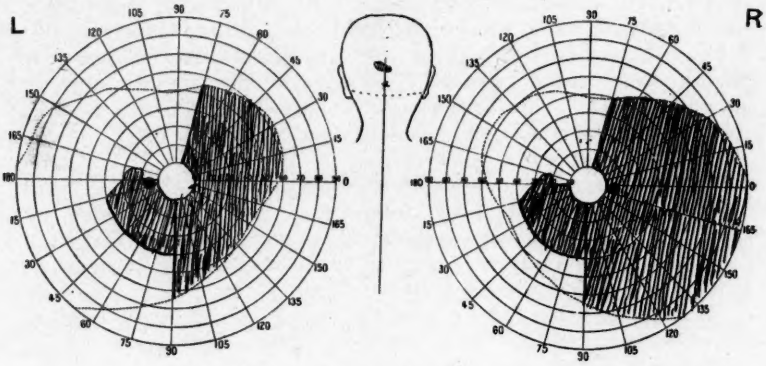
THE first of my cases is an example of temporary concussion amblyopia.

CASE 1.—Private S., while standing in a trench, was struck on the top of the head by a bullet. The missile produced a gutter-shaped scalp wound, about two inches long, just over the posterior part of the right parietal bone, but the bone itself was not fractured. Immediately "everything seemed black" to him, but he did not lose consciousness. Fifteen minutes later his vision began to

return, when he "seemed to be looking through a sheet of black glass." He was "able to recognize the corporal and then suddenly" he "could see quite well." Ten days later his vision was normal and his visual fields full.

He states that simultaneously with the blow he had ringing in his ears, and that even now any sharp noise in the ward causes a recurrence of the tinnitus. He also states that he temporarily "lost the use of his legs." Now he walks quite well, but the muscles of his left leg occasionally jerk.

CASE II.—Corporal H. In November, 1917, a bullet went right through this man's steel helmet and struck the back of his head. He was rendered almost blind and was "led in" by one of his comrades. The bullet had fractured his skull over a small area,



and after trephining an opening was found in the dura and also some damage to the brain. After three days his vision began to return, and at the end of three weeks he could read, but with difficulty. Condition on admission (? January, 1918). He had a small pulsating hernia cerebri on the back of his head, just to the left of the middle line. If a line is drawn from one auditory meatus round the back of the head to the other, then the lower edge of the opening in the skull is 5 cm. above this line, or 2.5 cm. above the inion, and two-thirds of the opening is to the left of the middle line. The radiograph shows a small opening in the skull, but no other abnormality. His vision was R.E.=6/6; L.E. = 6/6; fundi normal.

The perimeter chart shows loss of the right halves of his fields of vision and also partial loss of the left halves. The locality of the trauma is probably too high up to involve the centre for macular vision. The dorsal surfaces of the visual areas are both overlaid by the superficial wound, but the right to a less extent than the left.

With this the fields agree. The lesion is not so high up on the right side and the periphery of the corresponding fields is not affected. The original trauma and the hernia cerebri would probably injure some depth of brain tissue, even down through the calcarine fissure and this might account for the upper parts of the fields on the more affected side being involved. That part of the fields in the upper halves between 90° and 75° is not affected.

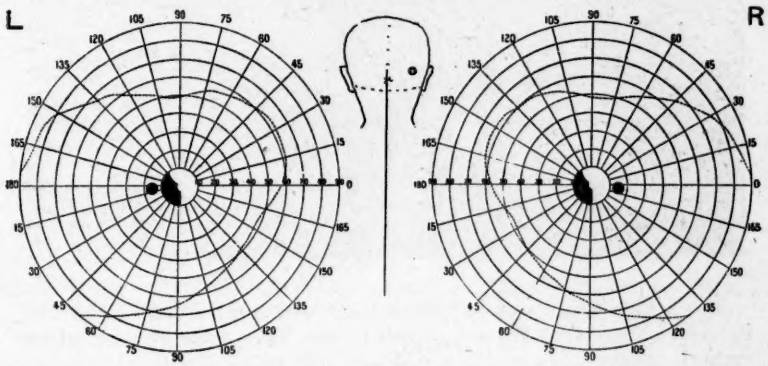
The fields were taken on several occasions and seven months from the date on which he was wounded the condition still persisted. I should add that I did not observe any loss of colour perception in the remaining parts of his fields.

He states that when his vision began to return he saw things blurred, then later he could read, but only by spelling the words first. When admitted here he could read fairly well. He could write to dictation and then read his own writing. Of course when looking at a long word he could only see one half of it.

Elsewhere[1] I have recorded the case of a soldier who had a penetrating wound of the occipital bone, also on the left side. Of this case I wrote: "He has great difficulty in reading. The long words he spells and then pronounces them. He writes freely and quickly to dictation, but is unable, by sight, to write out a sentence from a newspaper. This defect is not due to loss of visual acuity."

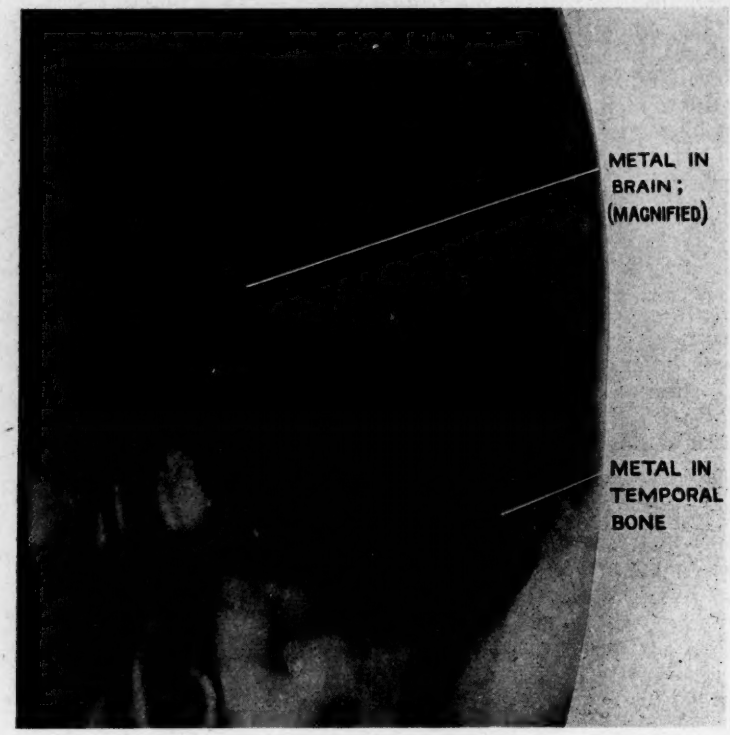
These cases presented some evidence of word-blindness. For most of our knowledge on this subject and its association with lesions of the left occipital lobe we are indebted to the late Dr. James Hinshelwood.

CASE III.—Private H. In March, 1918, a bullet struck the back of this man's head on the right side of the middle line. By



X rays the metal was located in the right occipital lobe and removed on the third day of his illness. He states that the injury rendered him unconscious, but only for a few minutes. His vision was dim for

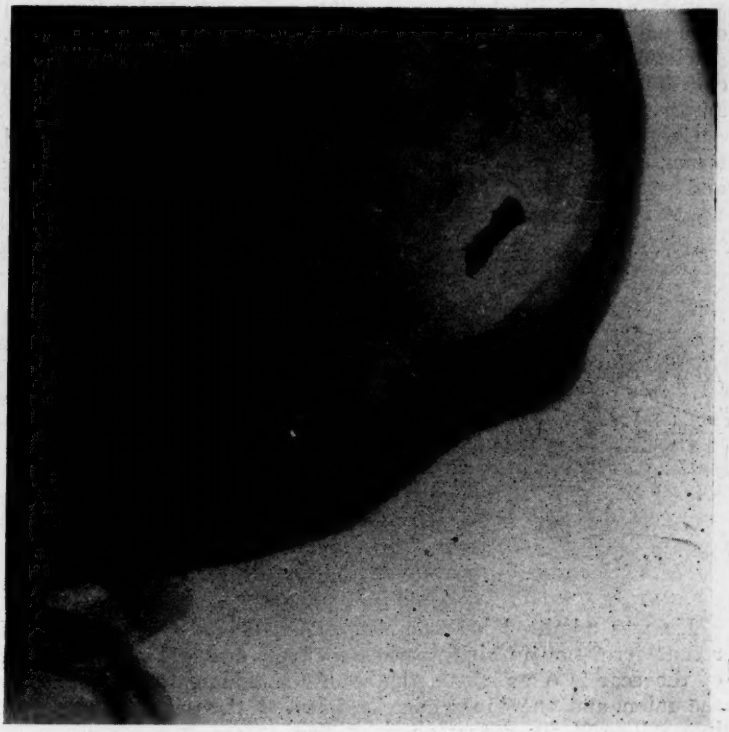
three days, that is, he could see people but could not recognize them; then his vision returned, but he saw everything double. His left eye was turned in, and he says his pupils were described as being unequal. The diplopia lasted for eight weeks. There was no record of his fields having been examined. Condition on admission, May 24, 1918: His vision was R.E.=6/6; L.E.=6/6; fundi normal; pupils equal and active; no strabismus. He has a trephine opening 3·5 cm. above the intermeatal line or 1 cm. above the inion, and 5 cm. to the right of the middle line.



His fields show a small scotoma for white and colours in the left halves of the visual fields and within the 10° circle. The point of central fixation has escaped. When two people approach him he has difficulty in seeing the one on his left. The locality of the trephine opening is lower down than in the previous case, and although there must have been a fairly deep trauma, the effect is

much more limited. Probably the mesial part of the cortex has escaped, as the trephine opening is a considerable distance from the middle line, and the suggestion follows that this part may be concerned with central fixation.

CASE IV.—Private S. On September 5, 1918, a piece of shell struck the left side of this man's head, and the injury was described as a "penetrating wound, temporo-maxillary joint; cleaned up but no f.b. found."



He was admitted to this hospital on September 11, 1918. Just in front of his left auditory meatus he had a small clean wound into which a probe could be passed for one inch. The left side of his face was paralysed, but not completely, and he was deaf in the left ear. He could not hear a watch in contact with his ear, but could hear a tuning fork by bone conduction. He did not suffer from headache, nor had he any head symptoms and he said

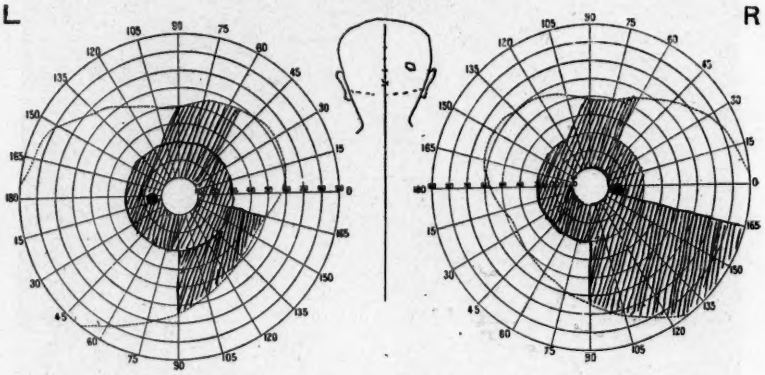
he felt quite well. His vision was normal in each eye; the fundi were normal and the pupil reactions were normal.

His head was X-rayed and two pieces of metal were discovered; a small piece in the bone just in front of the ear and another in the left occipital lobe, in the visual area.

Several radiographs were taken in order to lessen the chance of error in localization. These radiographs show a piece of metal about 1·5 cm. × 4 mm. lying obliquely in the left occipital lobe. It is about 1 cm. from the posterior surface and about 1 cm. from the mesial plane of the brain. It is about 2 cm. from the external occipital protuberance, measuring from the outer surface of the bone.

The fields for white and colours were normal. The metal in its course from the front of the ear has not torn any optic radiations and seems to be lying under the centre for macular vision.

CASE V.—Private R. On August 9, 1918, a piece of metal struck the back of this man's head. He was rendered unconscious and remained so for four hours. The X ray report from France was, "Possible fracture of right parietal."



He was admitted here on August 29, 1918. He had a scar of recent formation in right parieto-occipital area. The lower edge of the scar is 6 cm. above the intermeatal line, or 3.5 cm. above the inion, and the inner edge is 5 cm. to the right of the middle line. The X ray report obtained here states, "No evidence of fracture." When he reads "a mist comes in front of his eyes," but this may be due to the fact that he has 3 D. of hypermetropia. His age is 27, and his vision R.E.=6/18; L.E.=6/18; fundi normal. On taking his visual fields with the perimeter, it was found that there was an area of dim vision, especially in the vertical meridians, but no actual scotoma. Further, he could only recognize colours within the 10° circle.

When the white test object, moving in the horizontal meridians,

entered the area represented shaded on the chart, he said "dull," and when it crossed the 10° circle he said "bright." The test object did not disappear, but became dull. In the vertical meridians it was mostly "dull all the way in" till it crossed the 10° circle, then "bright" suddenly.

He has some loss of peripheral vision, to a greater extent in the vertical than the horizontal meridians.

The condition was probably due to concussion, and the dorsal surfaces would probably suffer more than the ventral.

This would harmonize with the suggestion of Gordon Holmes that the "vertical axes are represented in the dorsal and ventral margins of the visual areas."

REFERENCE

1. *Glasgow Medical Journal*, May, 1919.

ANNOTATIONS

Ophthalmologists and the Royal Colleges

We regret to find the Royal College of Surgeons of England and the Royal College of Physicians of London, ranged with the General Medical Council in believing that it is not desirable to institute a special examination in ophthalmology conducted by ophthalmologists as part of the final examination, and further that the present regulation relating to instruction in diseases of the eye meets the case. At a meeting of the Royal College of Physicians of London, held in July last, the College adopted the following report from the Committee of Management of the Conjoint Examining Board: "That the present Regulation, Section II, XXI, 6, covers the resolution of the General Medical Council, and that this Regulation requires a sufficient period of special instruction in ophthalmology: that the provisions of the Regulations, Section I, paragraphs VIII and IX, enable the teachers in ophthalmology in the medical schools and hospitals to hold class examinations and to institute such conditions for attendance on the course as they consider desirable before certificates of attendance are granted by them." In our view it is most unfortunate that the bodies concerned have refused to adopt the carefully thought out recommendations of the Council of British Ophthalmologists, which it will be remembered advised that:

(1) No student shall be admitted to the final examination, qualifying to practise medicine, unless he has attended an

ophthalmic clinic for not less than six hours a week during a period of three months, and has attended a course of systematic instruction in ophthalmology, and

(2) No student shall be considered to have passed the qualifying examination unless he has shown a sound knowledge of practical ophthalmology in an examination conducted by ophthalmic surgeons.

We may remind readers that in July last the Oxford Ophthalmological Congress determined to make representations to the General Medical Congress in support of those referred to that body by the Council of British Ophthalmologists.

In spite of official discouragement we trust the subject will not be lost sight of by those interested in the welfare of the community.

Railwaymen's Sight

The following letters appeared in the correspondence columns of *The Times* too late for reproduction in the August number of this journal:

EYESIGHT TESTS

To the Editor of *The Times*

Sir,—I am reluctant to trouble you with a second letter on this subject, but I feel bound to point out that Mr J. Herbert Parsons has again failed to diagnose the North-Eastern strike correctly. The alleged grievance of the strikers had reference not, as he assumes, to a colour test, but to a test for form vision—that is, a test for short sight, not for colour-blindness, for which the company have a different test altogether. Mr. Parsons reminds your readers that "people are not always satisfied when they get what they ask for;" that may be a good reason for not giving them what they demand, but I am not clear that it affords a justification for a strike.

I am, Sir, yours faithfully,

A. KAYE BUTTERWORTH.

NEWCASTLE-UPON-TYNE,
July 22.

EYESIGHT TESTS

To the Editor of *The Times*

Sir,—I had not intended to trouble you with any further communication on this subject, but Sir A. Kaye Butterworth quite misunderstands my attitude. He is naturally most concerned with his own railway, and appears to think that I hold a brief for the men. I am only concerned with the scientific principles involved, and it is merely the fact that the N.E.R. strike is attributed to eyesight tests that brings this railway into undue prominence. I may be wrong in my views, but stated briefly, they are as follows:—(1) The safety of the public and the men themselves depends upon efficient eyesight of engine-drivers and firemen. (2) Efficient eyesight can be determined only by scientific tests applied

by competent examiners. (3) Eyesight tests may be used by ignorant or unscrupulous persons as a subject of political propaganda. (4) Pandering to this spirit is rightly regarded by the men as a sign of weakness, and, instead of causing satisfaction, increases that attitude of suspicion to the employers which is so much to be deplored and leads to further and greater troubles.

I am, Sir, yours faithfully,

J. HERBERT PARSONS.

54, QUEEN ANNE STREET, W. 1,
July 24

Titles of Communications

Only those whose business leads them to search ophthalmological or other scientific literature in pursuit of information about a given subject can fully realize the difficulties caused by ambiguous titles. How many valuable contributions are cleverly hidden under such titles as "An interesting Case," "A Case for Diagnosis," and so forth. The writer well recalls a paper being submitted to him entitled, "Supposed death from Atropin," and the indignation with which his query was received when he asked if there was any doubt of the death having taken place. To be of service to readers a title should set forth, as briefly as may be, the contents of a communication, so that the nature of an article may be gathered at a glance. This is by no means always an easy task, but all titles that fail to fulfil the necessary conditions should be ruthlessly dealt with by the editor of the journal in which the article is to be published. On the other hand, there are authors who select lengthened titles, which in point of fact amount to an abstract of the contents of the communication they cover. This is cumbrous, although it is not so much to be condemned as the fault first mentioned. In fact, the briefer the title, consistent with lucidity, the better. The last fault is the omission of a title, throwing the onus of selecting one upon somebody else.

ABSTRACTS

I.—SYMPATHETIC OPHTHALMITIS

(1) **Carpenter, E. R.—Some points relative to enucleation of the eyeball and sympathetic inflammation.** *Med. Press and Circular*, November 21, 1917.

(1) **Carpenter** believes that the more conservative methods of dealing with injured eyes would in many cases be justified since the

improved appearance would outweigh the risk involved. He touches upon some of the substitutes for enucleation, particularly upon evisceration.

S. S.

(2) **Weekers, L. (Liège).—The lessons of the war on the subject of sympathetic ophthalmia. (Les enseignements de la guerre au sujet de l'ophtalmie sympathique.)** *La Clin. Ophtal.*, March, 1917.

(2) **Weekers'** article is of a somewhat speculative type, and is based on his own experience and that of a certain number of other observers, an experience which seems to show that in this war sympathetic ophthalmia is very rare. At the same time he throws considerable doubt upon pre-war statistics as to frequency, pointing out how two completely different conditions, true sympathetic disease and sympathetic irritation, have been grouped together. If only statistics of true sympathetic be taken, the figures will be considerably lower. Weekers avers that in ten years of practice in a hospital town he has himself only seen two cases, while during the war he has had no cases at all among 800 ocular injuries. Similarly de Lapersonne has had no sympathetic among 1,000 cases of war injury to the eyes. The reviewer gathers that Weekers suggests that while in this war sympathetic is certainly very rare, the disease was on the road to become the greatest rarity even before the war. The war cases show by their small numbers that true sympathetic is tending to disappear. This diminution is due to surgical cleanliness. Other points made by Weekers are (1) that early ablation of the eye is not justified from the prophylactic standpoint. One can wait a few days and save a certain proportion of eyes, always bearing in mind that it is better to sacrifice a sightless eye than to run risks; (2) that exenteration is preferable to enucleation. It gives as good security, Weekers says, as enucleation and is much superior in its aesthetic results.

ERNEST THOMSON.

(3) **Wilson, James Alexander (Glasgow). — Sympathetic ophthalmia: Some observations on etiology.** *Glasgow Medical Journal*, April, 1918.

(3) **Wilson** summarizes the various theories of sympathetic ophthalmia as (1) Nerve irritation, (2) Infection carried by the optic nerves, (3) General infection through the blood stream, (4) Anaphylaxis. There are various objections to the first three. Anaphylaxis may yet be shown to be responsible, but at present the evidence is inadequate and contradictory. The author then proceeds to consider toxaemias. Toxaemias, such as those produced by tobacco, alcohol, etc., affect the eyes in various ways, but do not

produce the condition commonly seen in sympathetic. On the other hand, infective conditions and auto-toxaemias occasionally produce uveitis. The uveitis found in these cases may not have the same histological structure as that found in sympathetic, but such cases are of interest in this connection. Do the organisms or toxins pass into the blood stream and act in a selective manner on the tissues of the eyeball, or do they act primarily on the nervous system and react on the eye tissues? Wilson then adduces as an analogy the fact that herpes ophthalmicus may give rise to sixth nerve paralysis and to uveitis (case given); that localized tetanus may be produced, viâ the nerve cells, from the introduction of tetanus organisms at the region concerned. "It must, I think, be admitted that central neuro-toxaemias produce peripheral manifestations in various forms, and that among these is uveitis. If so, then the necessity for the presence of pathogenic organisms in the second eye may be excluded. Central disturbances evolve influences —apparently efferent—of an atrophic or pernicious nature, which produce characteristic and constant types of peripheral manifestations. In sympathetic ophthalmia something from the first eye may pass up the optic nerve and tracts and reach the lower centres on both sides. What passes up the nerve and tracts may be a material something, and what returns in response may be only nerve influence, atrophic or pernicious in character." The close connection between the optic and third nerves is well known (pupil reactions). After some further anatomical considerations, Wilson says: "The suggestions from these observations are that in sympathetic ophthalmia—as in tetanus—toxins pass up the nerve and reach the nerve cells. In this case from the decussation at the chiasma, they reach the nerve cells on both sides of the brain, causing a central disturbance with efferent influences—as in herpes —which manifest themselves first as capillary changes and then as uveitis." There also follows the suggestion that the disease may be described as neurotoxic ophthalmia. Wilson's article is a suggestive contribution to the discussion of a subject of perennial interest.

ERNEST THOMSON.

(4) **Schieck, F. (Halle a. S.)—The onset of sympathetic ophthalmia in spite of preventive enucleation and its significance in the pathogenesis of the disease. (Das Auftreten der sympathischen Ophthalmie trotz erfolgter Präventivenucleation und seine Bedeutung für die Lehre von der Entstehung der Krankheit.)** *Archiv f. Ophthal.*, Vol. XCV., Part iv.: 1918.

(4) **Schieck** comments on the extreme rarity of sympathetic ophthalmia occurring after a preventive enucleation has been

performed. He has brought together all the cases recorded—30, from the Report of the Committee (*Trans. Ophthal. Soc. U.K.*, 1886), of which 6 are rejected, 45 from the recent literature (3 of which he rejects), and from a circular enquiry issued in 1916 amongst colleagues in Germany and other available countries he has collected 24 more (3 not accepted), a total of some 80 cases. Of those in the latter 2 groups he gives a short summary in tabular form.

The failure of a preventive enucleation to avert the outbreak of sympathetic disease may be due to various causes: (*a*) In the injured eye, an incomplete enucleation (or exenteration), some remnants of the uveal tract being left behind to form the seat of inflammation; the bursting of the eyeball in making a complete excision, whereby some germs in the eye may escape into the severed blood-vessels; by the time the enucleation is performed the sympathetic process has passed beyond the sclerotic (Fuchs) or in consequence of a counter-opening in the posterior part of the sclerotic, uveal tissue has escaped into Tenon's capsule or the orbital tissues and there formed a focus of inflammation. (*b*) As regards the sympathising eye, at the time the excision was performed, the infection was in process of extending to it, or had actually reached it, although it was not possible to determine this fact clinically; both eyes suffer from the same disease, the infection being already in the body and not introduced through the injured eye (Meller's theory).

The fact that the infection may have reached the second eye without showing any clinical signs, leads the author to the opinion that the methods of clinical examination hitherto employed are not sufficiently fine, and it is owing to this fact that the outbreak of sympathetic inflammation has in a certain percentage of cases occasioned surprise. As an additional means of detecting it in its early stages, he strongly recommends Gullstrand's lamp, and illustrates the advantageous use of it by the report of a case. The difficulty of early detection of the disease after enucleation, is increased by the fact that in some cases it runs a very mild course without any congestion or other apparent signs, and even in more severe cases it may for some time show no symptoms sufficient to attract the attention of the patient or his friends. This may be due to the attenuated virulence of the organism, or to the fact that the disease may have a short preliminary phase, without any gross symptoms, which passes off spontaneously, and only when it recurs is so severe as to drive the patient to seek advice. This latter attack being then regarded as the commencement of the inflammation.

The periods that elapsed between enucleation and the date of onset of sympathetic ophthalmia in the above series of eighty cases, are shown in a table at intervals of ten days, the majority of cases occurring within the first ten days; the maximum period accepted

by Schieck, as admissible, is fifty-three days—this obtained in two cases recorded respectively by Little and Stephenson. He is of opinion that the danger for the second eye has passed after four weeks from the date of the enucleation, although in exceptional cases it may not be free for two or three weeks more. All observations in which the onset is stated to have exceeded this maximum interval he regards as either unsound or owing their record to the fact that the enucleation (or exenteration) had been incomplete. As regards the pathogenesis of the disease, the author discusses Meller's view, but rejects it as based on findings that would only lead to confusion in our knowledge and conception of the disease. The pure theory of metastasis he does not accept in its entirety. For him only two conditions are essential, viz., the invasion of specific organisms into the circulation, and the facilitating of a foothold in the other eye for them through vascular disturbances due to reflex nerve irritation. He is of opinion that in rare cases the injury introduces the organisms into the circulation and thereby produces a ***simultaneous*** infection of the uvea in both eyes. In such cases even enucleation within the first twenty-four hours will not prevent the outbreak of sympathetic ophthalmia.

THOMAS SNOWBALL.

(5) **Van Schevensteen, Jr., A.—Sympathetic ophthalmia (second communication).** *Ann. d'Ocul.*, Vol. CLV, August, 1918.

(5) In the present paper **Van Schevensteen** gives the clinical notes and the pathological findings in a case where from faulty cicatrization after extraction of a traumatic (penetrating war injury) cataract, inflammation developed not only in that eye but in the other, which fortunately recovered fully. The soldier, aged 31, had had his right lacrimal sac excised on January 7, 1916, when vision was found to be full, refraction emmetropic, and fundus normal. On August 19, 1917, whilst he was loading a trench mortar the projectile burst, and a small chip penetrated his right eye. On October 18, 1917, when seen by Van Schevensteen, the eye showed a small wound near centre of cornea up-in; anterior chamber normal; pupil reactions normal; iris colour good, but on the pupillary border towards 5 o'clock was a small notch enclosing a small metallic foreign body embedded in superficial layers of the opaque lens, round the foreign body an iron-impregnated halo about 1 mm. wide. Tension normal, projection perfect.

Left eye emmetropic, with full vision and normal fundus.

On Nov. 21, 1917, operation for removal of the cataractous lens. All went well till after the cystotome had been used and lens masses evacuated, when patient squeezed unexpectedly and violently, causing prolapse of iris, which had to be cut off. Anterior chamber filled with blood; atropin; both eyes tied up; to bed; quiet; chloral morphine.

Nov. 22, 1917.—Total hyphaema, no pain; continue atropin and pad. Hyphaema slow in absorbing, for five days after operation it was still 5/6th; wound healed, no pain; behaved well during after-treatment.

Dec. 15. Hyphaema gone, no redness or pain; iris slightly drawn up to wound, but coloboma said to be regular; iris markings very slightly dulled; some lens matter in coloboma; vision=fingers at 1m. Tension normal (!) L.V. full.

Jan. 9, 1918. Some pains over left eye; no ciliary injection, no headache; nothing amiss with operated right eye.

Jan. 11. Left, ciliary injection and slight photophobia with watering, globe tender, iris markings slightly obscured; pupil dilates widely after atropin, but pupil edge slightly notched. Fundus not very sharp, disc edges softened, retinal veins full. Vision=0.4. Tension slightly reduced.

Right. Keratitis punctata, quite marked ciliary injection, projection and vision all as before; no pain. Diagnosis of early sympathetic ophthalmia. Intravenous injections of novarsenobenzol 0·30. Atropin. Rest.

Jan. 14. No better. Right enucleated.

Jan. 15. Left pupil wide, edge of pupil regular now; no precipitates on lens capsule or back of cornea; aqueous clear. Fundus normal; vitreous seems clear. Vision=0·5. Watering and photophobia gone.

Ciliary injection much less; no pain or tenderness. Novarsnobenzol 0·45.

Jan. 22. Vision 0·6. Fundus less obscured.

Jan. 26. Novarsenobenzol 0·45. Pupil quite wide.

Jan. 31. Vision fell to 0·4; fundus barely so crisp; vitreous clear.

Feb. 3. Novarsenobenzol 0·45. Vision=0·5.

Feb. 9. Fundus crisper; novarsenobenzol 0.45.

Feb. 17. Vision=0·5.

Feb. 22. Eye quite white; iris colour normal; markings crisp; pupil quite regularly circular. Vision =0·6. Stop atropin.

March 9. Vision=0·8. No symptoms.

April 28. Vision=1·0 After mydriatic fundus normal.

July 15. Cure confirmed; vision=1; fundus normal.

Morax examined sections of the eye and reported, *inter alia*, iris and corneal wound showed lymphocytic infiltration, with some pigmented and non-pigmented deposits on Descemet's membrane. Conspicuous thickening and infiltration of choroid-vessels seen only here and there; retina shows no infiltration; the choroidal lesions are those typical of sympathetic uveitis.

Van Schevensteen refers to Morax's paper* on the Statistics of

*Abstract *vide* BRITISH JOURNAL OF OPHTHALMOLOGY, August, 1918.

these War Sympathetic Cases, and notes that Morax finds 1/3 serious, but Van Schevensteen says the results obtained at time of recording are not always maintained, and as regards his own case, which got credit for 4/10ths, it really fell to 1/10th. Probably some of Morax's 4/10ths and 3/10ths cases were tested at a stage of only temporary arrest in the process and so further following up of these cases would give even less favourable results than Morax's figures would suggest.

No note is given as to X-ray examination of either eye, nor of the Wassermann reaction, but the case is of sufficient importance to warrant the degree of detail given in this abstract.

W. C. SOUTER.

(6) **van Schevensteen.—Notes on sympathetic ophthalmia. (Considérations sur l'ophtalmie sympathique.)** *Arch. Med. belges*, December, 1918.

(6) **van Schevensteen** gives a useful summary of the known facts and theories of sympathetic ophthalmia. He has only met with two cases during his service with the Belgian Army. The results of treatment with novarsenobenzol were good in one case and bad in the other. He discusses very briefly the question of protective appliances for the soldier, and is unable to say which of the different models is most likely to be of service. He concludes that all ocular injuries should come under an ophthalmic surgeon, who must always remember that prevention is better than any remedy in the affection here discussed, and that enucleation should be performed within the first fortnight after injury if certainty of prevention is required.

E. E. H.

(7) **Ichikawa, K. (Kioto, Japan).—Spindle-like formations in the inflamed uveal tissue of sympathetic ophthalmitis. With one coloured plate.** *Amer. Jl. Ophthal.*, January, 1919.

Ichikawa claims to have made remarkable findings in the course of an investigation into the bacteriology of seven eyes enucleated for sympathetic ophthalmitis. He had embarked upon the research with the object of throwing light upon the relationship of the exciting cause of the disease to that of syphilis—the favourable results of treatment with salvarsan in sympathetic inflammation being well known.

Levaditi's method was used for the identification of spirochaetes. Six of the eyeballs had already been embedded in celloidin, and had to be freed from that medium for this method. All the eyes were sympathizing eyes, and showed the typical picture of sympathetic ophthalmia. The result of the investigation, however,

was negative for spirochaetes, and the author proceeded to make further research into the aetiology of the disease.

Although there is some similarity between the histology of this affection and that of tubercle, no one has been able to demonstrate the presence of tubercle bacilli in sympathetic inflammation. His search for other bacteria was also negative. The fact that no one had used the method of Ohtori in investigating sympathetic inflammation led him to employ the principle of this stain. His sections had been kept in the clinic for a long time, and at first his results were entirely negative. Occasionally, however, he found in the inflammed uveal tissue spindle shaped bodies which appeared to him to have special significance, and he describes them in considerable detail.

Morphologically they are spindles measuring from 6.64μ to 2.82μ in length, and from 1.0μ to 0.5μ in thickness. They stain unevenly — lighter and darker portions alternating so that the spindles show a spotted appearance. They are fuchsinophile, not acid-fast, but alcohol-fast; in long exposure to acid they lose their stain quickly. Giemsa and eosin stain slightly, but methylene blue and Gram are negative. The best method employed was a modification of Ohtori's stain for tubercle bacilli, and was as follows:—

1. Staining with carbol-fuchsin for three to four hours (better in incubator).
2. After rinsing in distilled water for five to six seconds, stain in the following solution:—

Saturated solution of picric acid	100.0
Indigocarmin	0.5

3. Wash in distilled water.
4. Differentiate in absolute alcohol.
5. Xylol balsam.

In successful staining, the spindles stain with fuchsin red, collagenous tissue and nucleus with indigocarmin green, red blood cells reddish-yellow. The granules of eosinophile leucocytes are stained red, and the spindles in the tissue occur almost without exception in the bodies of the leucocytes. They are found exclusively in inflamed uveal tissue, and often in the vicinity of giant cells where the eosinophiles tend to assemble. They always lie singly, and are therefore easily overlooked.

With regard to the frequency with which the spindles occur in sympathetic ophthalmia, of the author's 7 cases only 5 showed their presence, and of these 5 only 2 showed them in any considerable numbers. He was unable to demonstrate their presence in any other type of inflammation, control experiments being made on 3 cases of phthisis bulbi, on 3 cases of non-sympathetic uveitis after perforating injury, and on 1 case of tuberculosis of the iris and ciliary body.

Discussing the nature of the spindles, the author disposes of the possibility of their being artefacts by drawing attention to the fact that of the 5 eyeballs which showed positive results 4 were fixed in Mueller's solution, and the other in Orth-Mueller solution, immediately after enucleation. Of the 2 eyeballs in which the test was negative one was fixed in Zenker's solution and the other in formalin.

The author inclines to the view that they are crystalline in nature, and have resulted from the melting together or crystallization of the eosinophile granules. He instances the theory of the formation of the so-called Charcot-Leyden crystals, believed by some to be crystalline products of these granules. He appears to renounce the idea that the spindles are of the nature of a micro-organism, although he alludes to the existence of fusiform bacilli such as Vincent's bacillus, etc. He is of opinion that further investigation would be necessary to clear up their true nature, but does not intend to assert that they are of any importance for the etiology of sympathetic ophthalmitis.

J. HAMITON MCILROY.

II.—REMEDIES

(1) **Rönne, Henning (Copenhagen).—On the aetiology and treatment of keratomalacia. (Ueber die Aetiologie und Behandlung der Keratomalacie.)** *Klin. Monatsbl. f. Augenheilk.*, Vol. LVII, September-October, 1916.

(1) **Rönne** deprecates the grave pessimistic prognosis of keratomalacia given in most text-books of ophthalmology, and contends that with timely diagnosis and appropriate treatment the prospect of recovery is quite good.

So far as Denmark is concerned, xerosis is almost wholly a dietetic disorder in the narrowest sense, a grave general disease being only exceptionally the cause of it.

In cases of keratomalacia, the history is almost invariably the same. Change of the child's diet from milk to carbohydrate or buttermilk, necessitated by some disorder of the bowels at a prior date; the putting on of weight and apparent thriving of the child on the new diet, and its unduly long continuance by the parents not noticing that, though the child has grown big, its look is not healthy, being pale and fat with flabby drooping limbs; in a few months, or even half a year—the younger the child the sooner—the onset of an apparently negligible conjunctival ailment, often taken no notice of at the start, and in about eight to fourteen days later sudden appearance of necrosis of the cornea, the child

becoming moribund from pneumonia. Rönne warns parents against continued use of the changed diet without medical advice, especially in infants.

As long-continued buttermilk diet is no less responsible for keratomalacia than carbohydrate diet, Rönne has no doubt that the real cause of the disease is lack of milk or some substance contained in milk, as evidenced by the almost complete freedom from the malady of milk-fed children and the almost miraculous recovery, not only of the eye but of the general health, when milk is given in sufficient quantity to the suffering child.

The disease occurs mostly in spring. Rönne is struck by the relationship between time of year and the incidence of the disease, although in Denmark life as regards diet and fasting is essentially the same all the year round.

The main question is that of treatment. It should be started as early in the disease as possible, and consist of feeding the child with as large a quantity of unadulterated raw milk as it can take, undeterred by the bowel symptoms that may be present and by the statement of the parents that it does not tolerate milk. The milk is extremely well borne, the progress of the keratomalacia stops and the child recovers rapidly within a few days. At first the excessive fluid in the tissues of the carbohydrate-fed child is eliminated by excessive diuresis, thus reducing the weight of the body; this need cause no alarm. Owing to the extreme urgency of energetic and effective treatment in the first few days of the disease, he has not ventured to use cooked milk; he is chary of recommending its use until it has been tried with caution in very benign cases and its therapeutic value proved. D. V. GIRI.

(2) **Hegner, A. (Jena).—Severe necrosis of the cornea in a case of salvarsan poisoning. (Schwere Hornhautnekrose bei Salvarsan Vergiftung.)** *Klin. Monatsbl. f. Augenheilk.*, Nov.-Dec., 1917.

(2) **Hegner** describes and discusses the following case: An engine driver, aged 45, infected with syphilis twenty years ago, received two injections of neo-salvarsan. This was followed by swelling of the right arm and shortly after by redness of the skin of the whole body. The skin affection soon cleared up but the swelling of the arm was very obstinate. The patient came to the Medical Clinic and was found to be suffering from cerebro-spinal syphilis. The Wassermann reaction was positive. A third injection of neo-salvarsan was given and this was again followed by redness of the whole body. The patient was admitted to the Skin Clinic. The whole of the skin became oedematous, and the temperature rose with symptoms of pneumonia. The eyelids now became swollen and ulcers appeared in each cornea. The whole of the corneae

ultimately sloughed, and the patient died of pneumonia and heart failure. Before death a large bedsore developed under the sacrum. At the post-mortem the following was found: General infection from the bedsore. Several ulcers of the skin and generalised salvarsan dermatitis. Marked anasarca of the legs, veins patent. Degeneration of the heart muscle and dilatation of the right side of the heart. Oedema and pneumonia of both lungs. High-grade mesaortitis of the thoracic aorta. Cicatrices in the left testicle, and general gland swelling. Chronic lepto-meningitis. Ulceration of the epiglottis and larynx with diffuse laryngitis. Old ulcer of the duodenum partially cicatrised. Fresh ulcers and large haemorrhagic erosions of the lesser curvature of the stomach. Hypertrophy of the adrenal cortex with fatty degeneration of the whole organ. Hyperostosis of the skull. Pachymeningitis interna with osteomata of the dura. Ossification of the epiglottis and of the cartilages of the first pair of ribs. Multiple abnormalities. There was no doubt that the diagnosis of salvarsan poisoning was correct.

T. HARRISON BUTLER.

(3) **Darier, A** (Paris).—**Cure of a case of detachment of the retina by puncture and subconjunctival injections.** (**Un cas de décollement de la rétine guéri. Ponction et injections sous-conjonctivales.**) *La Clin. Ophtal.*, January, 1919.

(3) **Darier** relates a very good case of cure of the detachment in a myope by the use of puncture associated with injections of acoinated serum gelatine with six per cent sodium chloride, and rest in bed. The case was favourable in so far as it was recent, but unfavourable in that there was a retinal tear. Treatment was instituted in August, 1918, and the retina remained attached at the time of writing. It must be admitted that that is not yet a very long time. Ten years have now elapsed since the reviewer published in the *Ophthalmoscope*, a series of articles entitled, "Detachment of the Retina Reviewed." How far has the treatment advanced since then? Certainly very little, but in this article Darier seems to have come to certain conclusions as to the best methods upon which to rely. Yet his percentage figure of cures seems to remain pretty exactly at the figure then ascertained for all writers on the subject, namely, 10 per cent. To be accurate, Darier says 10 per cent. of cures and 30 per cent. of "ameliorations" in the cases susceptible of treatment.

What then are the best means upon which to rely according to Darier? First of all, in the comparatively mild cases of traumatic detachment where the case is seen early, rest in bed, a pressure bandage not too firmly applied, leeches, and, if there has been haemorrhage, pilocarpine or eserine and dionine. If the detachment remains after five or six days, subconjunctival injections of sodium

chloride 2 per cent. or 4 per cent. even up to 10 or 20 per cent. In the more serious myopic cases Darier begins with the same treatment and goes on when necessary to retinal puncture. Prolonged dorsal decubitus is necessary, and the patient requires careful watching in this respect. Diaphoresis by pilocarpine or salicylate of soda may be employed. In the presence of a positive Wassermann, general antisyphilitic treatment should be carried out, and the subconjunctival injections may be made with cyanide of mercury, according to the following formula:

Cocain hydrochloride	...	...	0·5
Cyanide of mercury	...	...	0·05
Chloride of sodium	...	...	2·00
Sterilized water ...	...	...	100·00

One cubic centimeter of this to be injected deeply behind the eyeball every four or five days.

If, on the other hand, there is a tuberculin response the treatment should be directed in this sense. Subconjunctival injections of tuberculin are not to be recommended, though hypodermic injections have given encouraging results in the hands of Dor and von Hippel. Darier himself, however, considers that, as in other cases, the best local treatment is that by injections of sodium chloride or cyanide of mercury.

ERNEST THOMSON.

(4) **Dor, L. (Lyons).—Sympathetic ophthalmia cured without enucleation. (Une observation d'ophtalmie sympathique guérie sans énucleation).** *La Clin. Ophtal.*, January, 1919.

(4) **Dor** has had under treatment a soldier wounded at the sclero-corneal limbus, with prolapse of the iris, who refused enucleation after the onset of sympathetic about three weeks later. The iris had been excised and the site covered by a conjunctival flap. When the sympathetic affection had already been in existence two months the patient was seen by Dor. After consideration of the actual condition, and bearing in mind the man's definite statement that his sight was improving, it was decided, in consultation with Professor Rollet and Dr. Jacqueau, not now to recommend enucleation. Very vigorous treatment was instituted, in the first place with salicylate of soda by the mouth, and afterwards with intravenous injections of cyanide of mercury. Subconjunctival injections of auto-serum were also attempted, but seemed to do harm. The patient was also leeched at the temples and had frontal mercurial frictions. Altogether the man received 24 centigrammes of cyanide and 440 grammes of salicylate. Three months after the onset of the sympathetic trouble the right V. (wounded eye) was 1/5 and the left V.A. 2/3. Dor regards the cure as due to the salicylate rather than to the cyanide.

ERNEST THOMSON.

(5) **Gros, H. (Boulogne-sur-Mer) and Fromaget, H. (Bordeaux).—The analgesic action of a weak faradic current in ocular therapeutics. (Action analgésiante du courant faradique faible en thérapeutique oculaire.)** *La Clin. Ophtal.*, January, 1919.

(5) The authors of this rather interesting little article appear to have been themselves sceptical when in 1914 one of them relieved the pains of iritis with the faradic current. War put an end to further investigations in this branch of therapeutics, but they have now returned to the subject and have treated a number of cases of pain, especially in the eye region, with a very weak faradic current obtained from the simplest possible apparatus. They have been very gratified with the result in cases of neuralgia, irido-cyclitis, acute conjunctivitis, keratitis, glaucoma, and in sciatica. But real migraine and rheumatic pains are not lessened by this treatment. The seat of pain is covered with moist compresses on which rests a large plaque of malleable metal which is attached to one pole of the secondary coil, the other pole being held in the hand by a metal grip. The amount of current should be such as can just be felt without being in any way disagreeable. If a result is not obtained in two or three minutes it is not likely to be obtained by a longer application of the current. This article contains a distinct therapeutic hint which can be acted upon very easily.

ERNEST THOMSON.

(6) **Ryerson, G. Sterling (Toronto).—On the treatment of certain forms of opacity of the cornea and vitreous.** *Canada Lancet*, April, 1919.

(6) **Ryerson**, has found benefit in the denser forms of corneal opacity and, he believes, in opacities of the vitreous, from calomel ointment (one drachm to one ounce of vaseline). A small quantity is placed in the conjunctival sac and a rather thick layer is spread over the eyelids, and the eye is covered with a pad and bandage and with a thin flannel bandage, so as to exert moderate pressure. The dressing is worn for two hours daily.

S. S.

(7) **Livingstone, Donald McFarlane (Aldershot). — Colloidal manganese in gonorrhoeal ophthalmia.** *Brit. Med. Journ.*, April 5, 1919.

(7) **Livingstone** has successfully employed colloidal manganese in three cases of gonorrhoeal ophthalmia, and speaks in high terms of the remedy, which is given in doses of 1 c.cm. by injection into the buttock. Details are given of a severe case in a man of 24 years.

S. S.

(8) **McIlroy, J. Hamilton (Glasgow). — Methylene blue in purulent discharge from the eye socket.** *Brit. Med. Journ.*, April 5, 1919.

(8) **McIlroy** has found the local use of methylene blue (1 in 1,000 saline solution) most useful in the treatment of discharging sockets after enucleation of the eyeball. The prevailing micro-organism obtained by agar cultures from nine cases of discharging socket was the ***staphylococcus aureus***, although methylene blue was found to have little bactericidal action upon subcultures made from the organisms obtained from the discharge. S. S.

BOOK NOTICES

The Blind; Their condition, and the work being done for them in the United States. By HARRY BEST, Ph.D. The Macmillan Co., New York. April, 1919.

In this volume of 763 pages the author gives a very comprehensive account of the Blind in the United States, considered from almost every point of view. He has collected and arranged in handy form a really vast amount of information, general, technical, and statistical, and there is evidence throughout that no pains have been spared to render this information as trustworthy as possible.

As should be the case in all books of reference, an analytical table of contents enables the reader to find, with the least possible trouble, the information he desires. The scope of the work can be indicated most clearly by the headings of its seven parts:

Part I (Chaps. 1-5). General condition of the Blind.

Part II (Chaps. 6-11). Blindness and the possibilities of its Prevention.

Part III (Chaps. 12-25). Provision for the Education of Blind Children.

Part IV (Chaps. 26-29). Intellectual Provision for the Adult Blind.

Part V (Chaps. 30-42). Material Provision for the Blind.

Part VI (Chaps. 43-45). Organizations interested in the Blind.

Part VII. Conclusions with respect to the Work for the Blind.

A detailed review of Mr. Best's book would occupy much space; all that we can undertake is to refer briefly to some of the many statements of general interest which it contains and to offer a few criticisms.

The number of persons returned as "blind" in the United States Census of 1910 (the latest available figures) is 57,272, but the

actual number is believed to be nearer 70,000. The total blind population of the world is estimated to be at least 2,300,000—not including those blinded in the recent war. The proportion of blind to the total population, in the leading countries, is highest in Egypt (13,251 per million) and lowest in Belgium (435 per million). In the United States the number is 623 and in England and Wales 730 per million. While there appears to be no definition of blindness which is common to all the States of America, "the definition of blindness as the possession of not more than one-tenth of normal vision is beginning to be adopted in . . . compensation laws and has been theoretically accepted by the United States Government for persons blinded in military service."

A fact in strange contrast to the conditions obtaining in this country is that "the largest number of the male blind in any single specific occupation are engaged in farming."

The chapter on the economic condition of the blind is worthy of attention in view of the efforts now being made in most countries to further the technical education, and thereby the earning capacity of the blind. From the statistics furnished, it appears that, in the United States, of the blind population over 10 years of age, 16·8 per cent.—about one in six—are "gainfully employed." This compares with 53·3 per cent. of the general population.

From the chapter on "Causes of Blindness," which contains much statistical information, we quote the following: ". . . External injury constitutes the most important cause through the greater part of life, from the first to the fifty-fourth year. From the first year it increases gradually to the nineteenth year . . . after which it almost as gradually decreases."

The inclusion of "neuralgia" as a cause of blindness and as "a kindred affection of glaucoma," is probably due to too rigid adherence to census returns by a non-medical investigator. The same criticism applies to some statements in the chapter on Blindness and Heredity. In a footnote the author says, "According to the census . . . the diseases which are found to exert a hereditary influence are cataract, glaucoma, neuralgia, scrofula, measles, and strained eyes." It is easy to see how such returns, often made by the uneducated relatives of the blind, may lead a lay writer astray. We suggest that in another edition this section of the book might advantageously be submitted to the medical helpers mentioned in the preface.

The education of, and material provision for, the blind are dealt with at great length. The former section contains an interesting historical chapter on the efforts made to teach the blind from the time of Cardano, an Italian physician (1501-1576), who was the first to undertake such instruction. In the latter section the author deals very fully with Homes and Industrial Establishments, and

follows this by discussing the questions of pensions and indemnities for the blind, devoting a chapter to the consideration of the compensation laws for working men blinded in the course of their employment.

The last chapter of the book, containing the author's conclusions with respect to the work for the blind in the United States, gives a brief survey of his laborious enquiries. While he fully recognizes that all is not done that should be done, he concludes that there is good reason to believe that the efforts being made by the Government and the public of the United States are tending towards diminution in the number of the blind, and to an all round improvement in measures to lessen the hardships of blindness.

J. B. LAWFORD.

The Medical Annual, 1919. Liverpool: John Wright & Sons, Ltd. Price £1 net.

This valuable work of reference on the past year's literature has again made its annual appearance. We notice with regret that the price has been doubled. Foster Moore has taken over the ophthalmic part of the book, and contributes abstracts of recent work on the welfare of the blind, cataract operation, trachoma, anaphylaxis, hemeralopia, sympathetic ophthalmitis, glioma, foreign body and other injuries of the eye, visual disturbances in cerebral lesions, visual standards, relation of intraocular pressure to blood pressure, plastic socket operations and one or two minor matters. The illustrations comprise two plates on trachoma, and two from Priestley Smith's paper on the blood pressure in the eye. In addition, there are some text illustrations reproduced from the BRITISH JOURNAL OF OPHTHALMOLOGY. The book is fully up to the usual high standard, and is a most useful work of reference.

E. E. H.

CORRESPONDENCE

TONOMETRIC VALUES

To the Editor of THE BRITISH JOURNAL OF OPHTHALMOLOGY.

SIR,—Having carefully read Colonel Elliot's criticism of my recent article, and Dr. McLean's fresh communication (B. J. O., Sept., 1919), I should like to add a little to what I have previously said on this subject.

First, as to the apparent inaccuracies of the Schiötz tonometer. McLean has shown beyond dispute, I think, that the Schiötz chart puts the intraocular pressure considerably lower than it really is. This does not surprise me, for my own experiments pointed in that direction (B. J. O., 1918, p. 268). It is the magnitude and irregularity of the apparent errors about which I am sceptical. In my article, I ventured to suggest that the large discrepancies were *possibly* due to non-closure of the tap between the manometer and the eye. I now gladly abandon that idea, for I see that it was effectually disposed of at Oxford, but I still hesitate to believe that the Schiötz, as ordinarily used, makes such large and irregular mistakes as it made in McLean's experimental tests. Here is one instance (p. 391): when the manometer registered 90 mm. Hg. the Schiötz said 76, and when the manometer said 110, the Schiötz said 72; meanwhile the McLean was at fault by only 3 mm. Hg. Why did the Schiötz behave in this erratic manner while the McLean was working so well? A detail referred to by Elliot in his letter will perhaps afford the answer.

During his experiments, McLean kept the cornea constantly wet with normal saline, and he has raised the question whether Schiötz and I "failed in this precaution." I did not wet the cornea and I doubt whether it was desirable to do so. The surface of the living cornea is not, as a rule, discoverably wet: it yields no visible moisture when touched with blotting-paper. But this is not all. McLean himself has observed that fluid remaining on the cornea may rise by capillary action into the barrel of the Schiötz, and may impair the reading, and he cites Paul Knapp to the same effect (p. 386); in constructing his own instrument he wisely avoided that possibility. May it not be that by constantly wetting the cornea in his test-experiments, he unintentionally put the Schiötz at a disadvantage, and caused it to make errors that it does not ordinarily make? That would be a satisfactory solution: it would largely exculpate the Schiötz, and it would show the value of the McLean modification. If the suggestion fail, like my previous one, I shall not regret having made it, for a true solution is often ultimately reached by a process of elimination. It will be a heavy blow to the tonometric work of recent years if we have, after all, to admit that the Schiötz, as ordinarily used, makes mistakes of 20 and 30 mm. Hg. and even more, as it did in these experiments.

Now a few words as to the accuracy of the McLean tonometer, a subject which I hardly touched in my article. I do not doubt that the instrument is admirably made, or that its novel features are improvements; indeed, I predicted a good while ago the adoption of a single weight, and of a scale showing approximate mercury-equivalents instead of a separate chart (B. J. O., 1918, p. 267 footnote). In short, the mechanism is not in question: I assume that

the pointer acts in accordance with the depression of the cornea. But *with what degree of accuracy does the depression of the cornea indicate the intraocular pressure?* We know that human eyes differ from each other as regards the thickness and other characters of the cornea and sclera, and that such differences must influence the yielding of the cornea to *some* extent, and therewith the position of the pointer, but I think we do not yet know what *amount* of error is likely to arise in this way, through no fault of instrument, operator, or patient. Schiötz's test-experiments, and my own, suggested that it may reach 8 or 10 mm. Hg., but as I have previously said, these results may not be quite applicable to living eyes. We want more evidence on this point. (May I say that I was relying on these observations, and not on the pig's eye dipped in formalin, when I said that eyes having the same internal pressures may give different readings, etc. The small formalin experiment was given as an illustration of what an artificially stiffened envelope will do, and showed it rather prettily, I thought.)

Elliot puts the question thus: "Have we in the McLean tonometer an accurate instrument whereby we can measure the intraocular pressure with the same accuracy as we estimate body temperature with the clinical thermometer?" and he answers it as follows: "I have been using the instrument side by side with my trusted Schiötz for some weeks past, and I think we have." I hope he is right, but how did he arrive at this opinion? One cannot test the accuracy of a new instrument by comparing it with an old one that is believed to be inaccurate. No doubt he found the McLean to be excellent in various respects, but he did not compare its readings with known intraocular pressures. That can be done only by means of the manometer.

Under McLean's manometric tests, conducted evidently with elaborate care, the instrument gave some exceedingly good results. Thus, in the case of three living cats under ether, the actual pressures according to the manometer were respectively 25, 22 and 22 mm. Hg, and the tonometer said 22, 23 and 24. Again, when manometric pressures ranging from 20 to 110 mm. Hg. were established in these same eyes, the tonometer was in no case at fault by more than 4 mm Hg. And again, when these eyes were excised and again treated as just stated, the maximum error was 4 mm. Hg. (The Schiötz meanwhile made errors ranging irregularly from 9 to 42 mm. Hg.; they grew larger, as a rule, as the pressure rose, and were always on the minus side). This is a fine record for the McLean; so far as I know it is unrivalled, but it relates to cats. What is the record for human eyes?

To measure the intraocular pressure with a manometer in a living human eye is a delicate and difficult undertaking, but McLean has accomplished it in four cases (glaucomatous eyes, under ether,

immediately before enucleation). He tested the Schiötz against the manometer on these four eyes and in each case it put the pressure too low, the errors ranging from 14 to 27 mm. Hg. He tested his own tonometer in the last two cases only—it was only then completed—and it gave excellent readings: 58 instead of 60 mm. Hg. in the one case, and 63 instead of 65 in the other.

These results show a high degree of accuracy, and they do more. They tend to show that a tonometer which reads truly on excised eyes is likely to read truly on living eyes of the same kind; and further they tend to show that a tonometer which is true for cats' eyes is likely to be true for human eyes; in short, to show that errors due to differences in the size of the eyeball and in the character of its envelope are probably very small—if true, a very welcome simplification of eye-tonometry. But the observations before us are too few to justify positive conclusions; one can only say what they *tend* to show, and look for further evidence.

What we want to know, of course, is the margin of inevitable error when the tonometer is used on living human eyes. We cannot ask that this shall be ascertained by *direct* experiment: that would mean testing the tonometer against a manometer in a large number of living human eyes, normal and abnormal—an impossibility; but *indirectly* we may probably get very near it. McLean has made a very large number of tests and may, I hope, be able to settle the matter from data already in his possession. I will, therefore, venture to ask for further information on certain points: (1) On what class of eyes did he regulate his tonometer (by *regulate* I mean test it against the manometer, and so fix the mercury-equivalents); on cats' eyes, dogs', rabbits', excised human eyes, or on these collectively? (2) What were the largest discrepancies between tonometer and manometer in one class of eyes, e.g., cats' or dogs'—unsatisfactory trials being, of course, excluded? (3) Did eyes of different classes, but with equal internal pressures, give equal tonometric readings, or how far did the readings differ? (4) Has the tonometer been tested against the manometer in excised human eyes lost through various disorders, and if so with what amount of discrepancy? I fear these are troublesome questions, but I make bold to put them because I am sure that in answering them McLean will enhance the value of his researches.

May I say, in conclusion, that I sincerely admire the patience, ingenuity and skill which McLean has devoted to this work and fully recognize its importance. Also that I am most heartily with my friend Colonel Elliot in his desire to promote advances in scientific tonometry. If I am over-cautious in this matter, it is because I have seen many disappointments. My own first efforts towards improvement in tonometry were published just forty years ago, and during many years thereafter I habitually, in certain cases,

turned to my tonometer for an "unbiassed second opinion"—but without complete confidence. The Fick was correct in principle but proved impracticable. The Maklakoff was distinctly better, but not precise enough. The Schiötz, as everyone knows, altered the situation greatly: now, for the first time, it was possible to estimate and record changes of pressure in a given eye with great precision, and, with somewhat less precision probably, to compare one eye with another. On the other hand, its mercury-equivalents were obviously questionable, and it was not the inventor's fault if what he offered as approximations were used as certainties; it now appears that they are considerably at fault, but we hardly yet know how far. The McLean tonometer, if I may venture an opinion, seems likely to go further still: to be more convenient, and to measure the intraocular pressure correctly "to within a few mm. of Hg.," which is what McLean claims for it, and all that can be reasonably expected; but, remembering the past, I still plead for caution.

Yours, etc.,

PRIESTLEY SMITH.

BIRMINGHAM, *Sept.* 2, 1919.